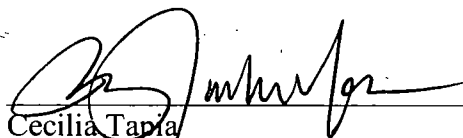


**FIVE-YEAR REVIEW REPORT
FOR
MADISON COUNTY MINES SUPERFUND SITE
MADISON COUNTY, MISSOURI**



**Prepared by
U.S. Environmental Protection Agency
Region 7
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Superfund

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EXECUTIVE SUMMARY

A statutory five-year review (FYR) has been completed for the Madison County Mines site (Site) located in Madison County and southern St. Francois County, Missouri. This is the first FYR for the Site.

The Site addresses mine waste in the form of chat and tailings and contamination of soil, sediment, groundwater and surface water related to nearly 250 years of mining and processing activities for lead, iron, cobalt, nickel, silver, zinc and tungsten. Lead was the primary metal mined at the Site prior to mining operations ceasing in the mid-1900s. The discovery of elevated blood lead in children in Madison County in the late 1990s prompted state and federal assessments and response actions. Wastes related to the former mining operation were determined to be the source of contamination resulting in human and ecological exposure.

The Site was listed on the National Priority List in August 2003. Currently, seven operable units (OUs) are designated for the Site and are identified as:

OU1 – Northern Madison County Unit: Includes Mine La Motte Tailings (approximately 250 acres) and adjoining Slime Pond (approximately 100 acres), Harmony Lake, Copper Mines (also known as Basler or Shoemaker Tailings), Offset Mine, Lindsey Mine, Old Jack Mine and a small gage feeder rail right-of-way. A tailings location at Harmony Lake was used as a soils repository during time-critical removal actions and is capped; Copper Mines chat was removed during remedial actions (RAs) in 2011. OU1 is included in the combined OU Supplemental Remedial Investigation/Feasibility Study (RI/FS) and remains in progress.

OU2 – Anschutz Subsite: Includes Tailings Areas A, B, C, D and E known as the Madison Mine; a metallurgical pond; former mills and smelter; a refinery complex; and chat pile and mine dump. The Tailings Areas have been graded and stabilized. The pond and dam, in addition to the drainages along the west side, have been reconstructed. A water treatment system pilot test is being conducted by Anschutz at a discharge point near Tolar Branch Creek. OU2 is included in the combined OU Supplemental RI/FS and remains in progress.

OU3 – Madwide Residential: Includes contaminated soils at residences, child high-use areas and public areas, all of which are included in the definition of “residential properties”; right-of-ways, storm water drainages, and roadways; Little St. Francis River (LSFR) subsite (also known as Pine Castle Estate) processing area and tailings. An Interim Record of Decision (IROD) was declared in July 2008 with the remedy described later in this summary. RA was implemented in September 2008 and remains ongoing. The Final OU3 Record of Decision (ROD) is pending.

OU4 – Conrad Tailings: Includes the entire Conrad subsite and the adjoining Ruth Mine complex. Conrad Tailings is used as the current residential soil repository for remedial action under the OU3 IROD. A ROD was declared in September 2011. The remedy includes: (1) co-locating mine waste, contaminated soil and sediment; (2) grading and capping the tailings/repository locations; (3) constructing containment structures for groundwater seeps/discharges; (4) removal of sediment and floodplain soils in downstream locations to Mill Creek; (5) removal of contaminated soil along Madison County Road 200; (6) monitoring quality of on-site groundwater and downstream surface water;

(7) creating wetlands for surface water treatment as needed, and; (8) ICs under the Missouri Environmental Covenants Act (MoECA). The remedial design (RD) was completed in September 2012 with RA pending.

OU5 – Catherine/Skaggs Piles: Includes Catherine Mines and Skaggs Tailings subsites and the former overhead tram to the LSFR subsite. A ROD was declared in September 2012. The remedies include: (1) co-locating mine waste and other contaminated media; (2) grading and capping the repositories; (3) monitored natural recovery (MNR) of downstream sediment and surface water, or removal of sediment and placement below cap if MNR is determined unsuccessful; (4) monitoring groundwater; (5) remediation of residential properties along the former tramway as part of the OU3 response actions, and; (6) ICs under the MoECA. The RD is being implemented with RA pending.

OU6 – Silver Mines: Includes the Silver Mines and Hickory Nut Mines 1, 2 and 3. Hickory Nut 3 chat was removed in 2010 as a child high-use area under OU3 RAs. Silver Mines is located on U.S. Forest Service property; further action is pending based on future negotiations and future development of interagency agreements. OU6 is included in the combined OU Supplemental RI/FS.

OU7 – LSFR Watershed: Includes all water courses that will not be addressed under the associated OU RAs. Currently, no action has been taken aside from historic data collections in creeks and drainage areas. Future actions will include engaging property owners and public involvement to assist steering this OU to RA.

Removal assessments were initiated in 2000, 2002 and 2003, and removal actions were implemented in 2001, 2003 and 2006 to address time-critical properties with lead concentrations exceeding 1,200 parts per million (ppm) and 800 ppm at residential properties. Removal actions continued through 2008 resulting in the remediation of 813 properties totaling an estimated 205,000 cubic yards of contaminated soil and mine waste removed, replaced and restored.

Remedial action has only been implemented for OU3, Madwide Residential, the subject of this five-year review (FYR). The Selected Remedy (remedy) for OU3 is the physical removal and replacement of soils at residential properties possessing a concentration of lead above 400 ppm. The remedy also includes establishing and maintaining institutional controls (ICs) with components including health education and establishing a Voluntary Institutional Control Pilot Project (VICPP). The VICPP will be evaluated after implementation to determine if additional ICs will be necessary to maintain protectiveness of the remedy. These components will be included in the Final OU3 ROD.

February 15, 2009, was the construction start for OU3 and February 15, 2013, was the start date for this FYR. Ongoing RA to date has resulted in the cleanup of 880 residential properties with over 447,000 cubic yards of contamination removed and replaced with clean soil. Approximately 525 residential properties remain to be sampled; approximately 220 of those will require remediation, an estimate based on the historic average that 42 percent of all properties sampled exceed 400 ppm lead. Approximately 100 properties that have been sampled and exceed 400 ppm have not been remediated but these are isolated samples along street right-of-ways, not full property quadrants. These properties will be re-assessed and addressed in the ongoing OU3 response actions.

The assessment for this FYR determined that the remedy is being constructed in accordance with the OU3 IROD remedy and is functioning as designed at the properties remediated. Health education has been fully implemented and is being administered by the Madison County Health Department (MCHD). The VICPP development is near completion and when implemented, its effectiveness will be evaluated.

LIST OF ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
BHHRA	baseline human health risk assessment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CIC	community involvement coordinator
CFR	Code of Federal Regulations
COC	chemical of concern
EPA/agency	U.S. Environmental Protection Agency
EBL	elevated blood lead
FYR	five-year review
ICs	institutional controls
IROD	Interim Record of Decision
LSFR	Little St. Francis River
MCHD	Madison County Health Department
MDHSS	Missouri Department of Health and Senior Services
MDNR	Missouri Department of Natural Resources
MNR	monitored natural recovery
MoECA	Missouri Environmental Covenants Act
NCP	National Contingency Plan
NPL	National Priorities List
O&M	operation and maintenance
OU	operable unit
ppm	parts per million
RA	remedial action
RAO	remedial action objective
RD	remedial design
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RPM	remedial project manager
RSL	regional screening level
TBC	to be considered
VICPP	Voluntary Institutional Controls Pilot Project

Five-Year Review Summary Form

SITE IDENTIFICATION

Site Name: Madison County Mines Superfund Site		
EPA ID: MO		
Region: 7	State: MO	City/County: Fredericktown/Madison

SITE STATUS

NPL Status: Final	
Multiple OUs? Yes	Has the site achieved construction completion? No

REVIEW STATUS

Lead agency: EPA
If "Other Federal Agency" was selected above, enter Agency name: Click here to enter text.
Author name (Federal or State Project Manager): Dan Kellerman
Author affiliation: Remedial Project Manager
Review period: 02/15/2009 – 07/31/2013
Date of site inspections: 01/07/2013 – 01/11/2013
Type of review: Statutory
Review number: 1
Triggering action date: 02/15/2009
Due date (five years after triggering action date): 02/15/2014

Five-Year Review Summary Form (continued)

Issues/Recommendations				
OU(s) without Issues/Recommendations Identified in the Five-Year Review:				
OU(s) 1, 2, 4, 5, 6 and 7 are pending the implementation of RA, therefore no assessments or recommendations are made concerning them.				

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 3	Issue Category: Remedy Performance			
	Issue: Gaining access to complete soil sampling of unsampled residential properties			
	Recommendation: Utilize both internal and external resources to physically visit residential properties to gain access and complete soil sampling			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
Yes	Yes	EPA	EPA	6/31/2014

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 3	Issue Category: Remedy Performance			
	Issue: Gaining access to complete remediation of outstanding residential properties exceeding 400 ppm lead			
	Recommendation: Initiate site-specific contract to gain access and remediate all outstanding residential properties requiring remediation			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
Yes	Yes	EPA	EPA	9/30/2015

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): 3	Issue Category: Institutional Controls			
	Issue: ICs have not been implemented			
	Recommendation: Complete VICPP development to implement, evaluate effectiveness and determine need for additional ICs			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	EPA	EPA	9/30/2015

Protectiveness Statement(s)

Include each individual OU protectiveness determination and statement. If you need to add more protectiveness determinations and statements for additional OUs, copy and paste the table below as many times as necessary to complete for each OU evaluated in the FYR report.

Operable Unit:
3

Protectiveness Determination:
Will be Protective

*Addendum Due Date
(if applicable):*
Click here to enter
date.

Protectiveness Statement:

The remedy under the OU3 IROD is expected to be protective of human health and the environment upon completion of construction. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

1.0 Introduction

The purpose of FYRs is to determine whether the RA is protective of human health and the environment. The methods, findings and conclusions of reviews are documented in FYR reports. In addition, FYR reports identify issues found during the review, if any, and recommendations to address them.

The U.S. Environmental Protection Agency is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) section 121(c) and the National Contingency Plan (NCP). CERCLA § 121(c) states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The EPA interpreted this requirement further in the NCP; 40 CFR § 300.430(f)(4)(ii) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

EPA Region 7 has conducted a FYR of the RAs implemented at Madwide Residential operable unit 3 (OU3) of the Madison County Mines Superfund site (Site). This review was conducted from September 2012 through July 31, 2013. This report documents the results of the review.

This is the first FYR for the Site. The triggering action for this review is the start of the RA on-site construction on February 15, 2009. This FYR is a statutory requirement for this NPL Site as a result of waste remaining below the excavation depth at residential properties. Properties with contamination remaining at depth have barriers placed prior to backfilling indicating the presence of contamination to prevent disturbance of the underlying soil. If the barrier is disturbed, the underlying soil will require special handling and disposal to prevent recontamination at the surface and the possibility of human exposure.

2.0 Site Chronology

Table 1: Chronology of Site Events

Event or Activity	Date
Mining Operations Time Span	1700s - 1960s
Tailings Impoundment Failure at Madison Mine	1977
Missouri Department of Conservation Investigation of Flood Event	1980
Missouri Department of Natural Resources (MDNR) Preliminary Assessment of Presence of Hazardous Waste	July 1983
MDNR Preliminary Assessment/Site Investigation	Feb 1986
Site Characterization Report	1990
Final Expanded Site Inspection Report	July 1995
Administrative Order on Consent for Site Characterization	Mar 1999
Final Report on PRP Search	Jan 2000
Administrative Order on Consent for Harmony Lake Removal Action	June 2000
Removal Action – Harmony Lake	Sept 2000
Administrative Order on Consent for Removal Action at Harmony Lake	Nov 2000
PRP Characterization Summary – Draft Report	Nov 2000
Madison County Health Department Request for EPA Assistance	June 2002
Unilateral Administrative Order on Consent for Removal Response Activities	Aug 2002
Removal Action – Fredericktown Farm Supply	Aug 2002
Removal Assessment – Madison Mine/ Fredericktown	Aug 2002
Removal Action – Madison Mine/Fredericktown	Mar 2003
Administrative Order on Consent for Removal Site Investigation	June 2003
Site Listing to the National Priority List	Sept 2003
Removal Assessment Summary Report	Feb 2003
Removal Action Madison County Mine	Aug 2004
ATSDR Public Health Assessment	Dec 2005
Feasibility Study	July 2005
Ecological Risk Assessment	May 2006
Removal Action Summary – Madison County Mines	Apr 2007
Final Baseline Human Health Risk Assessment	July 2007
Final Area-Wide Remedial Investigation Report	April 2008
Removal Action Summary Report – Fredericktown	June 2008
Interim Record of Decision OU3 – Residential Soils	July 2008
RA Start OU3 – Residential Soils	Feb 2009
Feasibility Study OU4 – Conrad Tailings	May 2011
Record of Decision OU4 – Conrad Tailings	Sept 2011
Feasibility Study OU5 – Catherine Mine and Skaggs Tailings	June 2012
Record of Decision OU5 – Catherine Mine and Skaggs Tailing	Sept 2012
Remedial Design – OU4 – Conrad Tailings	Sept 2012

3.0 Background

3.1 Physical Characteristics

The Site (see Figure 1) is located at the southern end of the Old Lead Belt in southeastern Missouri, approximately 80 miles south of St. Louis. The Site is approximately 520 square miles, occupying Madison County in its entirety and includes the Mine LaMotte Domain Tract that extends north into southern St. Francois County. Madison County is subdivided into the St. Francois Mountains on the western side of the county and the Salem Plateau on the eastern side of the county. Topographically, the St. Francois Mountains comprise a geologically mature landscape with rounded ridges and meandering streams that occupy comparatively wide valleys. In some locations, rivers and streams cut across ridges forming steep canyons. The two major water-bearing units in Madison County are associated with the Bonneterre Transition Zone and the Davis/Whetstone Creek Member.

OU3 – Residential Properties includes remediation of mine waste at residential properties exceeding 400 ppm lead and is the subject of this review. The remaining OUs at the Site possess mine waste at former mining locations and associated impacts to groundwater, surface water, sediment and soils.

3.2 Land and Resource Use

Madison County and southern St. Francois County are predominantly rural communities with light commercial businesses. Fredericktown, the county seat, is the largest city and most densely populated area within the Site. Junction City adjoins Fredericktown to the north, and Cobalt Village adjoins Fredericktown to the southeast. Marquand is also within the Site boundaries and is located approximately 20 miles to the southeast. Agriculture is the predominant land use since mining operations ceased in the mid 1900s. Industrial activities consist of light manufacturing, aggregate production and construction. Many forested areas of the county are logged for lumber products. The population of Madison County is approximately 12,200 residents including 4,774 households and 3,295 families according to the most recent census data. The county has approximately 291 business structures, 6 schools, 400 farms, 1 major river, 1 secondary river and 2 water supply districts.

3.3 History of Contamination

Mining in Madison County began in the early 1700s until operations ceased in the mid 1960s. The Madison Mine is historically referenced as the first lead mine west of the Mississippi River. Mine and processing waste generated throughout the mining operations at 13 major locations covers approximately 850 acres.

The mine waste includes tailings and chat ranging from silt and sand to gravel-sized particles. Development rock is present at most mine shaft and decline locations. The mine and processing areas were generally left unattended without containment with the resulting mine waste relatively unstable and subject to migration primarily through water erosion, and, to a lesser degree, wind erosion. Mine waste has migrated through natural processes from the waste piles to the surrounding land and downstream in water courses and has also been disturbed and distributed through human activity. Stream channel sediment and floodplain soil is impacted as a result of erosion and deposition. Chat and tailings were commonly excavated and transported to residential properties for use as construction grading, fill and

base material and for driveway surfaces. Contaminated soil was collected from contaminated creek floodplains and used for topsoil. Chat was widely used as aggregate for road base material and used in the production of asphalt and concrete.

3.4 Initial Response

The state of Missouri initiated studies in the early 1980s as a result of deteriorating stream conditions downstream from the former lead production areas. In the mid-to-late 1990s, EBL levels were detected in targeted child populations from 6 to 72 months of age. In 2000, the Madison County Health Department (MCHD) requested assistance from the agency to assess the source of lead contributing to exposure resulting in EBL. Soil sampling was initiated near and around residential properties where it was determined the presence of lead contamination is widespread throughout the county. Removal actions were initiated in 2000 to address time-critical levels of lead (greater than 1,200 ppm). The EPA became the lead agency for the Site which resulted in additional Superfund Investigation and Hazard Ranking System scoring. The Site was placed on the NPL in August 2003.

3.5 Basis for Taking Action

Hazardous substances were released at the Site from known metals mining operations dating back to the mid-1700s. Contaminants identified through various investigations included aluminum, antimony, arsenic, cadmium, chromium, iron, lead, manganese, nickel, molybdenite, selenium, thallium, vanadium and zinc. Lead is the primary chemical of concern (COC) for which cleanup goals have been established since its distribution is present at nearly every location in concentrations ranging from background concentrations below 200 ppm to 12,000 ppm. Young children (typically defined as seven years of age or younger) are the targeted population of primary concern potentially exposed to lead contamination at the Site. Young children are more susceptible to lead exposure than adults because they have higher contact rates with soil or dust, absorb lead more readily than adults and are more sensitive to the adverse effects of lead than are older children and adults. Thus, the most important exposure pathway for children is incidental ingestion of soil and dust. The effect of greatest concern in children is impairment of the nervous system including learning deficits, lowered intelligence and adverse effects on behavior.

Elevated blood lead was detected in the target child population group when testing began in 1997. A Baseline Human Health Risk Assessment (BHHRA) was completed in July 2007 and Preliminary Remediation Goals (PRGs) were identified in 2008 for the Site to evaluate exposure risks to residents from the ingestion of soil and groundwater. The agency mathematically identified a health-based protection goal using the Integrated Exposure and Uptake Biokinetic Model (IEUBK) that the probability of a child exceeding a blood lead level of 10 ug/dL should not exceed 5 percent. The concentration of lead determined from a site-specific evaluation of 970 properties to meet the health-based standard established as the PRG for the Site is 400 ppm using the X-ray Fluorescence method for analyses.

The OU3-Madwide Residential Soils IROD only addresses human health risk at residential properties within Madison County. Therefore, while an Ecological Risk Assessment was completed for the Site, a summary of it has not been included in this FYR. Other identified risks to human health and the environment will be addressed in future cleanup decisions.

4.0 Remedial Actions

4.1 Remedial Objectives

The strategy for the cleanup at the Site is to use a phased approach to first address contamination that presents the greatest threat to human health at residential properties. Remedial Action Objectives (RAOs) were developed as a result of data collected during the RI (2006) and the BHHRA (2007) to aid in the development and screening of remedial alternatives to be considered for the IROD. A single RAO was established for OU3 – Residential Soils consistent with the agency guidance including the Superfund Lead-Contaminated Residential Sites Handbook. The IROD for OU3 – Madwide Residential was signed on July 29, 2008. The RAO established under the OU3 IROD is to reduce the risk of exposure of children under seven years old to lead such that an individual child or group of similarly exposed children have no greater than a 5 percent chance of exceeding a blood lead level of 10 ug/dL.

4.2 Remedy Selection

The Selected Remedy in the 2008 IROD for OU3 – Residential Soils consists of the following:

- Excavation, backfilling and revegetation of lead-contaminated residential soil exceeding 400 ppm lead at an estimated 1,100 residential properties.
- Health education for Madison County to support and raise public awareness, conduct community-wide blood lead monitoring, distribute prevention information, hold meetings with and act as a resource for area physicians of local families and undertake special projects to increase awareness of how local citizens can protect themselves from heavy metal health risks. Collaboration with interested citizens and local, county, state and federal government officials on an ICs pilot project to discuss and evaluate future ICs to safeguard future residential development and protect remediated residential properties.

Under the remedy, residential properties with at least one quadrant surface soil sample testing greater than 400 ppm lead will have that quadrant removed and replaced. If the drip zone surface soil sample from any property where a soil quadrant is being replaced also exceeds a concentration of 400 ppm lead, the property will also have the drip-zone soil removed and replaced. Residential properties where only the drip-zone soil and no other quadrant soil exceed 400 ppm lead are not to be remediated. Based on historical information, it was projected that approximately 1,100 residential properties contain or are expected to contain surface soil concentrations greater than 400 ppm lead requiring remediation.

In general, excavation will increase in depth until the underlying soil is less than 400 ppm lead or to a maximum depth of 12 inches below ground surface (bgs), whichever is less. If at 12 inches bgs the lead soil concentration remains greater than 1,200 ppm, the agency will excavate deeper if it is determined that, by further excavation, a lead concentration of less than 1,200 ppm can be achieved. If the agency determines this cannot be achieved by further excavation, the agency will place a barrier at 12 inches bgs. The excavated soil will be disposed of at the Conrad tailings pile or an alternate location depending on the capacity of the Conrad tailings pile. Clean fill and topsoil will be used to replace excavated soil, returning the residential property to its original elevation, grade and use. The property would typically

be hydroseeded to restore the original vegetation unless conditions warrant restoring the property with sod. The estimated time for the cleanup of the 1,100 properties is approximately four years. Future land use is expected to continue to be residential.

The IC's component includes that a public health education program be implemented to address short-term risks during construction. Additionally, an IC pilot project would be initiated to further evaluate and develop ICs with the local citizen and government stakeholders' input to be included in the Final OU3 ROD. In particular, the agency will ultimately need ICs to ensure that the barriers and contaminated soil below them remains undisturbed or, if disturbed, is handled in a manner to ensure future development does not compromise the protectiveness of human health. The agency is required to consider community acceptance as a factor when selecting a remedy, including ICs, pursuant to 40 CFR § 300.430 (f)(i)(C). Because of the large number of properties affected, this effort will require a projected one to three year time frame to develop.

The components for the ICs include but are not necessarily limited to the following:

- Extensive, community-wide blood lead monitoring
- In-home assessments for children identified with EBL
- Health education to include:
 - Distributing exposure prevention information and literature
 - Holding meetings with and acting as a resource for area physicians of local families
 - Providing community education through meetings; literature; talks and presentations at civic clubs, schools, nurseries, preschools, churches, fairs, etc.; and one-on-one family assistance
- Voluntary IC pilot project (VICPP) to include:
 - Undertaking special projects to increase awareness of how local citizens can protect themselves from heavy metal health risks
 - Working with construction workers, developers, residents and local and county officials toward effective ICs to protect barriers and lead-contaminated soil at depth and ensure safe future development

4.3 Remedy Implementation

Soil Removal and Replacement

Soil removal and replacement for the OU3 RA began in February 2009. Remediation under the IROD to date has been performed using two site-specific contracts awarded to small businesses with incentives for local hiring, local spending and property-owner/agency satisfaction. To date, 880 properties of the original estimated 1,100 remaining properties projected in need of cleanup have been remediated. The RA remains ongoing. The local hiring and local material purchase incentives encourages use of local resources to boost the local economy and generate community acceptance of the RA.

Disposal and Maintenance

The OU3 IROD remedy provides that a location be developed as a repository for the disposal of contaminated soil. Access was granted by the owners of the Conrad Tailings pile for use as the residential soils repository and it continues to be used for the OU3 RA. Future maintenance is to be included as an operation and maintenance (O&M) expense under the OU4 ROD.

Revegetation and Restoration

Properties remediated are graded to their original condition and vegetated using hydroseed or sod as provided in the remedy. Property owners are provided an evaluation form to rate the contractor's work. RA performed at each property is not considered complete or "closed out" until the property is fully restored and approved by the agency. Property-owner and the agency's satisfaction of the completed residential properties are measured jointly to evaluate the quality of work being conducted and to evaluate the award of a financial incentive. Property-owner satisfaction relating to restoration plays a major role in the community's acceptance of the RA.

ICs

The development of ICs is being initiated with the VICPP with funding from the State Cooperative Agreement by the agency with the Missouri Department of Health and Senior Services (MDHSS) and implemented by the MCHD.

Blood lead screening of children 6 to 72 months is routinely conducted by MCHD and was offered during the last public availability session. In-home assessments are conducted by MCHD when EBL is detected in a child to determine if the source of lead contamination is from the home's interior. The agency is contacted if the source of lead exposure is suspected to be from the soil. If lead is confirmed in soils above 400 ppm, the property is considered a high priority for remediation.

Health education is being performed throughout the community with a wide distribution of informational bulletins, public and in-home presentations and discussions with residents and homeowners. A billboard has been placed in a high-traffic area encouraging blood lead testing for children. MCHD also provides educational information to schools and at city/county-wide events to share information about lead contamination and its related health effects.

MCHD sponsors quarterly roundtable meetings to discuss Site issues. Updates are provided by local, state and federal officials regarding Site progress. This forum facilitates efforts to improve public involvement and more effectively communicate both the importance and benefit the response actions have on public health. Roundtable meetings are publicly announced and regularly attended by local, state and federal government officials. The MCHD also serves as an information center for concerned citizens, local businesses and developers. Routine contacts are made to involve local banks, realtors, developers, contractors and other stakeholders in an effort to facilitate complete and successful implementation of the VICPP.

The VICPP manual is being developed and will identify the dangers of lead exposure and incorporate safe handling practices for lead contamination by the community. Madison County is designated a Class 3 county with limited taxation ability to fund and develop ordinances to protect its citizens from lead

exposure. The guidance manual, intended for use by residents, contractors and businesses, has been drafted and is being finalized to communicate the necessary measures for dealing with lead contamination in order to maintain the protectiveness of the remedy. Considering lead was mined for centuries at the Site and contamination is located throughout the county, it is reasonable to expect health education and full implementation of the VICPP will take several years to become recognized as common practice. However, when the majority of the residential population and working community fully comprehend the value and importance the remedy has on the protection of public health, the VICPP is expected to further ensure the remedy remains protective.

The EPA continues sharing property information from the EPA's lead soil database with MCHD to assist the county in the development and implementation of the VICPP for indefinite tracking and monitoring purposes. Eventually the database will be maintained at the state and local level allowing the sharing of physical property conditions with stakeholders to alert them of any need for special handling of soil and to prevent barrier and underlying soil disturbance.

Increased community awareness through health education and the VICPP will assist in preventing future exposure to lead contamination, providing continued protectiveness of the remedy. Residents are routinely making inquiries with MCHD and the EPA about the status of sampling and remediation on their properties. Contractors working throughout Madison County are also being informed of the need to address site conditions that could involve lead contamination. Within the past two years, numerous contractors performing large excavation and development projects have sought guidance to prepare work plans addressing potential or known lead contamination that may affect the scope of their projects. Although this may result in additional time and overhead expense, the willingness displayed by contractors to address these issues is evidence that health education is serving its intended role and that the VICPP in its development stage is becoming recognized and slowly evolving into standard practice.

4.4 Operation and Maintenance Activities

O&M has not been formally initiated since construction is not complete. O&M activities will be detailed in the Final OU3 ROD. Upon construction completion, statistical sampling of remediated properties will be conducted. The results of this and continued blood lead sampling will be included as measures by which continued protectiveness of the remedy will be evaluated.

5.0 Progress Since Last Review

This is the first FYR for the Site.

6.0 Five-year Review Process

6.1 Administrative Components

The FYR was conducted by Dan Kellerman, the EPA Region 7's remedial project manager (RPM) for the Site.

6.2 Community Involvement

The EPA Region 7 community involvement coordinator (CIC) for the Site serves as a contact for the

community with issues or concerns, provides notice for Site-related public meetings and special events and refers inquiries about technical issues and problems to the RPM for assistance. All calls and contacts made with the agency are answered by the CIC, the RPM or other supporting staff involved with the RA. Responses are timely to effectively maintain contact with the citizens of Madison County and to enhance the community's acceptance in completing the response actions at the Site.

Roundtable meetings are routinely conducted at the MCHD facility to keep the community apprised of the progress at the Site. The roundtable also serves as a forum to develop new ideas relating to the Site that will positively affect the health and actions of the community. The involvement of local officials, namely MCHD and the Madison County Commission (MCC), has been outstanding in recognition of the short- and long-term benefits the response actions have on the community.

A public availability session was held at the MCHD facility on March 5, 2013. The intent of the session was to provide an update of the OU3 RA and attempt to generate additional interest of the community, particularly those who have not had their properties sampled, to sign access agreements. In addition, MCHD provided blood lead testing.

The administrative record is maintained both at the EPA Region 7 office, Lenexa, Kansas, and the Ozark Regional Library, Fredericktown Branch, Fredericktown, Missouri for anyone interested in reviewing and becoming more familiar with decision documents related to the Site.

6.3 Document Review

The following documents were reviewed as part of this FYR:

- Baseline Human Health Risk Assessment,
- Madison County Mines Remedial Investigation
- OU3 Interim Record of Decision, July 2008
- Base Year Final Construction Report, Contract EPR70815, December 2010
- Option Year Final Construction Report, Contract EPR70815, December 2011
- Final Construction Report, Contract EPS70907, April 2012
- VICPP Draft Manual
- MDHSS/MCHD Blood Lead Data Summaries

6.4 Data Review

Numerous historical reports were reviewed including the most recent tracking documents associated with the progress of RA at OU3. Soil monitoring has not yet been conducted at properties that have been remediated since construction remains ongoing and residential properties are still being sampled to determine remediation needs. Currently, the effectiveness of the interim action is being evaluated through blood lead monitoring of the target child population.

6.5 Site Inspection/Interviews

The Site is visited routinely by the agency and MDNR as a result of ongoing RA for OU3 and work performed to complete response actions for the other OUs at the Site. Site interviews were conducted the week of January 7, 2013. Madison County officials were interviewed which included a review of the health education program and the VICPP. The main concern expressed during the interviews with county officials was continued funding for ICs, namely the VICPP.

Local and state officials generally participating in this and previous roundtable meetings included:

- Evan Kifer, MDNR
- Becky Hunt, MCHD
- Bob Brewen, MCHD
- Lorena Locke, MDHSS
- Arthur Busch, MDHSS
- Bob Mooney, MCC
- Tom Stevens, MCC
- Jim Thompson, MCC

Site progress was discussed in a roundtable meeting held on January 22, 2013. No major issues or concerns relating to response actions at the Site were expressed. In general, county and state officials were and are supportive of the actions and progress at the Site. All agreed that completing the RA in a timely fashion is desirable.

The public availability session held on March 5, 2013, at the MCHD facility provided the community a Site progress update and attempted to generate additional interest of the property owners who have failed to provide access for sampling and remediation. MCHD provided blood lead screening during the meeting. Unfortunately, the meeting was poorly attended by the public.

On April 23, 2013, a meeting was held in Jefferson City, Missouri, concerning the VICPP. Attendees included officials from MDNR, MDHSS, Madison County and the EPA. The purpose of the meeting was to present and discuss the OU3 IROD IC's component and discuss the development, future costs and the effectiveness the VICPP. Some concerns were expressed that the VICPP may not fully function independently without additional and/or formal ICs such as covenant and restrictions with individual property owners under the MoECA.

7.0 Technical Assessment

The FYR is conducted to determine whether implemented remedies at a site are protective of human health and the environment. The agency guidance describes three questions used to provide a framework for organizing and evaluating data and information and to ensure all relevant issues are considered when determining the protectiveness of a remedy. These questions are assessed and summarized for the Site in the sections that follow. Attachment B provides the detailed reports by the agency's Human Health and Ecological Risk Assessment Team to further support the answers to these questions.

7.1 Question A: Is the remedy functioning as intended by the decision documents?

The remedial activities completed to date at the Site are functioning as intended. Blood lead testing of the target child population from 2001 through 2012 confirms an 11 percent reduction in the detection of EBL levels exceeding 10 ug/dL in Madison County.

Remediation of residential properties is approximately 80 percent complete and properties with soil levels exceeding 400 ppm lead have been excavated to at least one foot with the contaminated soil stored at the Conrad Tailing Repository. A minimum of 1 foot of clean soil has been placed above any remaining contamination. If contaminated soil remains in excess of 400 ppm at one foot or 1,200 ppm at two feet, a demarcation barrier is installed before properties are backfilled and restored.

Implementation of Institutional Controls and Other Measures

Health education has been fully implemented and the VICPP is in the implementation phase as provided by the OU3 IROD remedy. The success of health education and the VICPP can only be measured over time. Health education will continue and the VICPP will be implemented and evaluated throughout the OU3 RA to determine if additional ICs will be necessary. Upon construction completion, a sampling plan for remediated properties will be developed to ensure remediated properties are not being recontaminated and the effectiveness of the remedy remains in place. Blood lead monitoring will also be continued.

7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

There are no risk-based cleanup levels identified as applicable or relevant and appropriate requirements (ARARs) in the IROD. There are no newly promulgated standards that call into question the protectiveness of the remedy. There have been no changes in the human exposure parameters or the toxicokinetic assumptions in the IEUBK. General discussions relating to the toxic effect of lead in humans have occurred over the past two years; however, toxicity data has not been formally revised. No changes to cleanup levels and the RAOs have occurred since the time of remedy selection, and the agency's health protection goal remains valid.

Changes in Exposure Pathways

No changes in the exposure pathways, ingestion of soil and water, have occurred. Since the exposure assumptions relate to residential settings, any changes in land use from residential to commercial or to vacant land would remain protective.

Changes in Land Use

The land use on-site and in the surrounding area has remained relatively unchanged throughout the duration of this Site's NPL listing. Some additional expansion of similar land uses has occurred for both residential and commercial settings throughout the county. However, no major land use changes have affected the decisions made to remediate the Site or called into question the protectiveness of the selected remedy.

New Contaminants and/or Contaminant Sources

No new contaminants or contaminant source areas have been identified aside from those originally identified throughout the course of all response actions at residential properties. Contaminants and contaminant source locations for all OUs continue to be assessed.

Remedy By-products

The RA at the Site results in no by-products that affect the protectiveness of the remedy.

Changes in Standards, Newly Promulgated Standards, To Be Considered

No changes in standards, newly promulgated standards or to be considereds have occurred that would impact either the RA or the protectiveness of the remedy at the Site.

Changes in Toxicity and Other Contaminant Characteristics

Toxicity factors for some of the COCs have changed. These include changes in concentrations for the Regional Screening Level toxicity values related to inhalation exposure for some heavy metals identified across the Site. Since the OU3 IROD focuses on lead as the main COC, these changes are not expected to affect the protectiveness of the remedy (see Attachment B, pages 3-4).

Changes in Risk Assessment Methods

Several IEUBK and adult lead methodology default parameters have been revised but do not affect the protectiveness of the remedy (see Attachment B, page 4).

Expected Progress Toward Meeting RAOs

Blood lead levels of the target child population exceeding 10 ug/dL have decreased from 13 percent in the 2001 to 2 percent for children tested across the county during the 2010 through 2012 testing period. Remediation of the remaining residential properties and source locations is projected to achieve the RAO such that children will have less than a 5 percent chance of exposure to lead that will result in a blood lead level exceeding 10 ug/dL. Since EBL can also result from in-home exposures unrelated to the contamination being addressed under the CERCLA OU3 actions, the agency should continue to work with local and state officials to ensure in-home assessments are continued to distinguish between CERCLA-related lead and other sources such as lead-based paint.

7.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other Site information has been identified calling into question the protectiveness of the Site remedy.

Ecological Risks

Ecological risks were not included as part of the decision-making process related to the OU3 IROD remedy. Ecological risks are to be addressed in the future under separate OU response actions for the Site (refer to Attachment B).

Natural Disaster Impacts

A major wind storm, defined by some weather experts as a land hurricane, occurred in May 2009. The event resulted in widespread uprooting of trees, but the total destruction of structures was limited. Shortly following the event, the agency and its contractors provided a general assessment of properties that had been remediated. Measures were taken to inform property owners of proper handling and disposal of underlying, contaminated soils disturbed as a result of the uprooting of trees in an effort to prevent recontamination at the surface. Exposed roots and soil at properties scheduled for remediation were addressed at the time of remediation by the agency's contractors. Future natural disaster events will be addressed during the ongoing RA and as part of the O&M responsibilities declared in the Final OU3 ROD.

Any Other Information That Could Call Into Question the Protectiveness of the Remedy

The VICPP is ultimately intended to function as a stand-alone IC component to monitor and track future activities that would involve the handling or mishandling of lead contamination, and, in general, facilitate community practices that will ultimately assist in maintaining the protectiveness of the remedy (such as barrier disturbance, redistributing contaminated soil, etc.). It is designed as a "voluntary" program due, in part, to Madison County's Class 3 designation.

Madison County has a low population with limited industry resulting in a low generation of tax revenue. This precludes the county from developing and enforcing zoning codes and ordinances that could otherwise provide for local, county-wide controls to regulate activities that can result in human exposure to lead. Controlling such activities at a federal or state level is extremely difficult when taking into account the high number of locations where disturbances could occur.

7.4 Technical Assessment Summary

The remedy at the Site is making progress toward meeting the RAO of reducing the risk of exposure of young children (children under seven years old) to lead such that an individual child or group of similarly exposed children have no greater than a 5 percent chance of exceeding a blood lead level of 10 ug/dL. To date, post excavation blood lead levels in target child populations across the county have been reduced from 13 percent near the start of the response actions to 2 percent.

Approximately 88 percent of all residential properties across the Site have been sampled with approximately 94 percent of those properties remediated. All known exposure pathways at remediated properties have been eliminated. Demarcation barriers (orange mesh or orange construction fencing)

have been placed at residential properties where contamination is left at depth to identify the presence of contamination to alert property owners, contractors and developers that the underlying soil should not be disturbed.

Sampling and remediation of the outstanding properties must be completed. Approximately 525 properties remain to be sampled. The agency must pursue contacting the property owners for access to sample and remediate properties with the use of both internal and external resources. Should future attempts to gain access for sampling fail, administrative orders should be considered to gain, at a minimum, access to complete sampling of the remaining residential properties.

The agency estimates approximately 220 properties remain to be remediated. The agency will initiate a remediation contract to complete the remediation of these properties after sampling of the outstanding properties is near completion. If the agency cannot gain access to remediate time critical concentrations of lead exceeding 1200 ppm lead, the agency should consider using administrative orders to complete remediation due to the imminent health risks associated with this level of contamination. Administrative orders should also be considered to require remediation of residential rental properties exceeding 400 ppm lead if access to remediate cannot be gained since a tenant could occupy a property without knowledge of the presence of contamination if they are not informed of such presence by the owner or landlord. If local officials are unaware of new tenants occupying the property, there would be no mechanism in place to inform a tenant of a presence of contamination.

Tracking and monitoring of properties that are not sampled, remediated or those properties remediated with demarcation barriers possessing contamination at depth should continue throughout the OU3 RA by the agency and continued indefinitely under the VICPP and O&M for the Site. Properties that remain contaminated with lead above 400 ppm, but do not fall under a category requiring remediation using an administrative order as indicated above, should also be tracked and closely monitored in order that current and future property owners can be informed of the presence and risk of exposure to lead contamination. The conversion of an owner-occupied property to a rental property that has not been remediated and possesses lead contamination above 400 ppm should be tracked and pursued for remediation.

Health education is currently being performed under the provisions of the remedy and must continue indefinitely. Educating school-aged children should result in behaviors and actions that will prevent future exposures to lead. Educating local government officials and their employees, residents, homeowners, landlords, developers and contractors on the adverse health effects of lead exposure and the liabilities under CERCLA associated with activities resulting in lead contamination will enhance their understanding of the importance to use best management practices when working around contaminated soil and mine waste.

Development and implementation of the VICPP should be completed in the immediate future. The EPA, state of Missouri and Madison County's officials must determine all measures by which its effectiveness can be evaluated and decide if it can function as a stand-alone IC that will provide for the long-term protectiveness of the remedy. In any event the VICPP is determined to not serve its intended function as a stand-alone IC, accompanying or alternate ICs must be considered in order to maintain long-term protectiveness of the remedy.

Remedy protectiveness determinations should continue to include the results of blood lead monitoring. Future sampling of remediated properties to determine if recontamination has occurred and a general monitoring of the actions of residents, developers and contractors as it relates to disturbance and distribution of any source of lead contamination that could result in human exposure should be incorporated in the ongoing response actions and future O&M.

8.0 Issues

TABLE 2: Issues

Issue #	Issue	Affects Protectiveness (Y/N)	
		Current	Future
1	Gaining access and completing soil sampling of residential properties	Y	Y
2	Gaining access and completing remediation of residential properties exceeding 400 ppm lead	Y	Y
3	ICs have not been implemented	N	Y

9.0 Recommendations and Follow-up Actions

Below is a list of recommended actions to address the issues identified in section 8 above. Two of the issues identified affect the current protectiveness of the remedy, and failure to address them could lead to potential human exposure impacting the future protectiveness of the remedy.

TABLE 3: Recommendations and Follow-up Actions

Issue #	Recommendations/Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1	Use both internal and external resources to physically visit residences to gain access and complete sampling of outstanding residential properties	EPA	EPA	6/31/14	Y	Y
2	Initiate site-specific contract(s) to gain access and complete remediation of all residential properties exceeding 400 ppm lead	EPA	EPA	9/30/15	Y	Y
3	Complete VICPP development to implement and evaluate effectiveness	EPA/MDNR	EPA/MDNR	9/30/15	N	Y

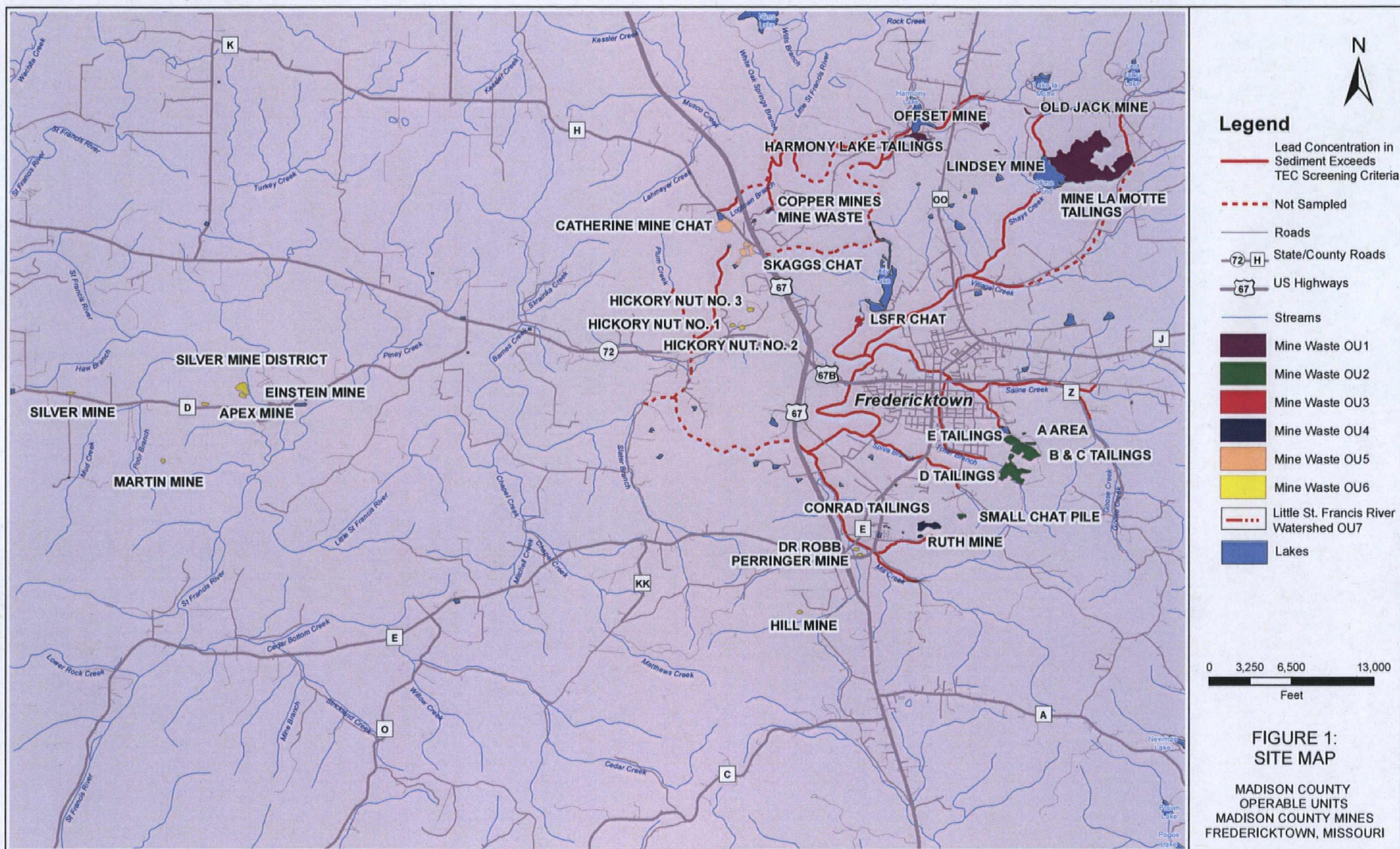
10.0 Protectiveness Statements

The remedy under the OU3 IROD is expected to be protective of human health and the environment upon completion of construction. In the interim, remedial activities completed to date have adequately addressed exposure pathways that could result in unacceptable risks in these areas.

11.0 Next Review

The next five-year review for the Site will be completed within five years from the signature date of this report.

Figure 1



Attachment A

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION				
Site name: <u>Madison County Mines</u>	Date of inspection: <u>Jan 7 thru 11, 2013</u>			
Location and Region: <u>Missouri, Region 7</u>	EPA ID: <u>MO0098633415</u>			
Agency, office, or company leading the five-year review: <u>EPA-Region 7-Superfund Div</u>	Weather/temperature: <u>Partly cloudy / 44°</u>			
Remedy Includes: (Check all that apply) <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input type="checkbox"/> Landfill cover/containment <input type="checkbox"/> Access controls <input checked="" type="checkbox"/> Institutional controls <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input type="checkbox"/> Other _____ </div> <div style="width: 50%;"> <input type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls </div> </div>				
Attachments: <input type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached				
II. INTERVIEWS (Check all that apply)				
1. O&M site manager _____ <table style="width: 100%; border: none;"> <tr> <td style="width: 40%; text-align: center;">Name</td> <td style="width: 20%; text-align: center;">Title</td> <td style="width: 40%; text-align: center;">Date</td> </tr> </table> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached _____ _____		Name	Title	Date
Name	Title	Date		
2. O&M staff _____ <table style="width: 100%; border: none;"> <tr> <td style="width: 40%; text-align: center;">Name</td> <td style="width: 20%; text-align: center;">Title</td> <td style="width: 40%; text-align: center;">Date</td> </tr> </table> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached _____ _____		Name	Title	Date
Name	Title	Date		

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Madison County Health Dept.
Contact Becky Hunt Administrator 01/09/2013 573-783-2747
Name Title Date Phone no.

Problems; suggestions; ☐ Report attached Concerns for ongoing funding for health education and VICPP; very supportive of the RA

Agency Madison County Commission
Contact Robert Moony Presiding Commissioner 01/09/2013 573-783-3410
Name Title Date Phone no.

Problems; suggestions; ☐ Report attached Concerns for ongoing funding for health education and VICPP; very supportive of the RA

Agency _____
Contact _____
Name Title Date Phone no.

Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____
Name Title Date Phone no.

Problems; suggestions; ☐ Report attached _____

4. **Other interviews (optional)** ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	O&M Documents <input type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A
2.	Site-Specific Health and Safety Plan <input type="checkbox"/> Contingency plan/emergency response plan Remarks _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A
3.	O&M and OSHA Training Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
4.	Permits and Service Agreements <input type="checkbox"/> Air discharge permit <input type="checkbox"/> Effluent discharge <input type="checkbox"/> Waste disposal, POTW <input type="checkbox"/> Other permits _____ Remarks _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A
5.	Gas Generation Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
6.	Settlement Monument Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
7.	Groundwater Monitoring Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
8.	Leachate Extraction Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
9.	Discharge Compliance Records <input type="checkbox"/> Air <input type="checkbox"/> Water (effluent) Remarks _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A
10.	Daily Access/Security Logs Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A

IV. O&M COSTS

1. O&M Organization

- ☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other _____

O&M not implemented with RA ongoing

2. O&M Cost Records

N/A

- ☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
 Original O&M cost estimate _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From _____	To _____	_____	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	
From _____	To _____	_____	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	
From _____	To _____	_____	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	
From _____	To _____	_____	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	
From _____	To _____	_____	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	

3. Unanticipated or Unusually High O&M Costs During Review Period

N/A

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A

Remarks _____

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A

Remarks *Barriers at depth illustrated on individual field sheets to be included in database records pending completion of RA*

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (e.g., self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____
Name _____ Title _____ Date _____ Phone no. _____

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☐ N/A
Other problems or suggestions: ☐ Report attached
IC implementation to be fully implemented upon
completion of RA

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks To be fully implemented at completion of RA

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks _____

2. **Land use changes on site** ☒ N/A
Remarks _____

3. **Land use changes off site** ☒ N/A
Remarks _____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks: Damage repaired by contractor or settlement for
repairs provided to county

B. Other Site Conditions

Remarks _____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A**A. Landfill Surface**

- | | | | |
|----|--|---|--|
| 1. | Settlement (Low spots)
Areal extent _____
Remarks _____ | <input type="checkbox"/> Location shown on site map
Depth _____ | <input type="checkbox"/> Settlement not evident |
| 2. | Cracks
Lengths _____ Widths _____
Remarks _____ | <input type="checkbox"/> Location shown on site map
Depths _____ | <input type="checkbox"/> Cracking not evident |
| 3. | Erosion
Areal extent _____
Remarks _____ | <input type="checkbox"/> Location shown on site map
Depth _____ | <input type="checkbox"/> Erosion not evident |
| 4. | Holes
Areal extent _____
Remarks _____ | <input type="checkbox"/> Location shown on site map
Depth _____ | <input type="checkbox"/> Holes not evident |
| 5. | Vegetative Cover
<input type="checkbox"/> Trees/Shrubs (indicate size and locations on a diagram)
Remarks _____ | <input type="checkbox"/> Grass <input type="checkbox"/> Cover properly established | <input type="checkbox"/> No signs of stress |
| 6. | Alternative Cover (armored rock, concrete, etc.)
Remarks _____ | <input checked="" type="checkbox"/> N/A | |
| 7. | Bulges
Areal extent _____
Remarks _____ | <input type="checkbox"/> Location shown on site map
Height _____ | <input type="checkbox"/> Bulges not evident |
| 8. | Wet Areas/Water Damage
<input type="checkbox"/> Wet areas
<input type="checkbox"/> Ponding
<input type="checkbox"/> Seeps
<input type="checkbox"/> Soft subgrade
Remarks _____ | <input type="checkbox"/> Wet areas/water damage not evident
<input type="checkbox"/> Location shown on site map
<input type="checkbox"/> Location shown on site map
<input type="checkbox"/> Location shown on site map
<input type="checkbox"/> Location shown on site map | Areal extent _____
Areal extent _____
Areal extent _____
Areal extent _____ |

9.	Slope Instability Areal extent _____ Remarks _____	<input type="checkbox"/> Slides <input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of slope instability	
B. Benches <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)			
1.	Flows Bypass Bench Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay	
2.	Bench Breached Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay	
3.	Bench Overtopped Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay	
C. Letdown Channels <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)			
1.	Settlement Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of settlement	
2.	Material Degradation Material type _____ Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of degradation	
3.	Erosion Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of erosion	

4.	Undercutting Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of undercutting	
5.	Obstructions Type _____ <input type="checkbox"/> Location shown on site map Areal extent _____ Size _____ Remarks _____	<input type="checkbox"/> No obstructions	
6.	Excessive Vegetative Growth Type _____ <input type="checkbox"/> No evidence of excessive growth <input type="checkbox"/> Vegetation in channels does not obstruct flow <input type="checkbox"/> Location shown on site map Areal extent _____ Remarks _____		
D. Cover Penetrations <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Gas Vents <input type="checkbox"/> Active <input type="checkbox"/> Passive <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____		
2.	Gas Monitoring Probes <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____		
3.	Monitoring Wells (within surface area of landfill) <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____		
4.	Leachate Extraction Wells <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____		
5.	Settlement Monuments <input type="checkbox"/> Located <input type="checkbox"/> Routinely surveyed <input type="checkbox"/> N/A Remarks _____		

E. Gas Collection and Treatment				<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	Gas Treatment Facilities				
	<input type="checkbox"/> Flaring	<input type="checkbox"/> Thermal destruction	<input type="checkbox"/> Collection for reuse		
	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs Maintenance			
	Remarks _____				
<hr/>					
2.	Gas Collection Wells, Manifolds and Piping				
	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs Maintenance			
	Remarks _____				
<hr/>					
3.	Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings)				
	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs Maintenance	<input type="checkbox"/> N/A		
	Remarks _____				
<hr/>					
F. Cover Drainage Layer				<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	Outlet Pipes Inspected		<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A	
	Remarks _____				
<hr/>					
2.	Outlet Rock Inspected		<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A	
	Remarks _____				
<hr/>					
G. Detention/Sedimentation Ponds				<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	Siltation	Areal extent _____	Depth _____	<input type="checkbox"/> N/A	
	<input type="checkbox"/> Siltation not evident				
	Remarks _____				
<hr/>					
2.	Erosion	Areal extent _____	Depth _____		
	<input type="checkbox"/> Erosion not evident				
	Remarks _____				
<hr/>					
3.	Outlet Works		<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A	
	Remarks _____				
<hr/>					
4.	Dam		<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A	
	Remarks _____				
<hr/>					

H. Retaining Walls <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
1.	Deformations <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Deformation not evident Horizontal displacement _____ Vertical displacement _____ Rotational displacement _____ Remarks _____
2.	Degradation <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Degradation not evident Remarks _____
I. Perimeter Ditches/Off-Site Discharge <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
1.	Siltation <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Siltation not evident Areal extent _____ Depth _____ Remarks _____
2.	Vegetative Growth <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Vegetation does not impede flow Areal extent _____ Type _____ Remarks _____
3.	Erosion <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Erosion not evident Areal extent _____ Depth _____ Remarks _____
4.	Discharge Structure <input type="checkbox"/> Functioning <input checked="" type="checkbox"/> N/A Remarks _____
VIII. VERTICAL BARRIER WALLS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
1.	Settlement <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Settlement not evident Areal extent _____ Depth _____ Remarks _____
2.	Performance Monitoring Type of monitoring _____ <input type="checkbox"/> Performance not monitored Frequency _____ <input type="checkbox"/> Evidence of breaching Head differential _____ Remarks _____

IX. GROUNDWATER/SURFACE WATER REMEDIES <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
1.	Pumps, Wellhead Plumbing, and Electrical <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells properly operating <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____ _____ _____
2.	Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____
3.	Spare Parts and Equipment <input type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided Remarks _____ _____
B. Surface Water Collection Structures, Pumps, and Pipelines <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
1.	Collection Structures, Pumps, and Electrical <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____
2.	Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____
3.	Spare Parts and Equipment <input type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided Remarks _____ _____

C. Treatment System		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	Treatment Train (Check components that apply) <input type="checkbox"/> Metals removal <input type="checkbox"/> Oil/water separation <input type="checkbox"/> Bioremediation <input type="checkbox"/> Air stripping <input type="checkbox"/> Carbon adsorbers <input type="checkbox"/> Filters <input type="checkbox"/> Additive (e.g., chelation agent, flocculent) _____ <input type="checkbox"/> Others _____ <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> Sampling ports properly marked and functional <input type="checkbox"/> Sampling/maintenance log displayed and up to date <input type="checkbox"/> Equipment properly identified <input type="checkbox"/> Quantity of groundwater treated annually _____ <input type="checkbox"/> Quantity of surface water treated annually _____ Remarks _____ _____		
2.	Electrical Enclosures and Panels (properly rated and functional) <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____		
3.	Tanks, Vaults, Storage Vessels <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Proper secondary containment <input type="checkbox"/> Needs Maintenance Remarks _____ _____		
4.	Discharge Structure and Appurtenances <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____		
5.	Treatment Building(s) <input type="checkbox"/> N/A <input type="checkbox"/> Good condition (esp. roof and doorways) <input type="checkbox"/> Needs repair <input type="checkbox"/> Chemicals and equipment properly stored Remarks _____ _____		
6.	Monitoring Wells (pump and treatment remedy) <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____ _____		
D. Monitoring Data			
1.	Monitoring Data <input type="checkbox"/> Is routinely submitted on time <input type="checkbox"/> Is of acceptable quality		
2.	Monitoring data suggests: <input type="checkbox"/> Groundwater plume is effectively contained <input type="checkbox"/> Contaminant concentrations are declining		

D. Monitored Natural Attenuation	
<div style="text-align: center; margin-bottom: 10px;">1. Monitoring Wells (natural attenuation remedy)</div> <div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> All required wells located </div> <div> <input type="checkbox"/> Functioning <input type="checkbox"/> Needs Maintenance </div> <div> <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> N/A </div> </div> <div style="border-top: 1px solid black; margin-top: 5px;"> Remarks _____ _____ </div>	
X. OTHER REMEDIES	
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.	
XI. OVERALL OBSERVATIONS	
A.	Implementation of the Remedy Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). <div style="border-bottom: 1px solid black; margin-top: 5px;">Addressed in FYR</div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div>
B.	Adequacy of O&M Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <div style="border-bottom: 1px solid black; margin-top: 5px;">To be fully implemented upon completion of RA</div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; margin-top: 5px;"></div>

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

completion of sampling and remediation of remaining
properties addressed in FYR

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Attachment B




**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7**

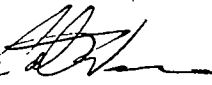
11201 Renner Boulevard
Lenexa, Kansas 66219

MAR - 4 2013

MEMORANDUM

SUBJECT: Comments on the Draft First Five-Year Review Report for the Madison County Mines Superfund Site
Madison County, Missouri
EPA ID: MOD098633415

FROM: Kelly Schumacher 
Human Health Risk Assessor
ENSV/EAMB

Catherine Wooster-Brown 
Ecological Risk Assessor
ENSV/EAMB

TO: Dan Kellerman
Remedial Project Manager
SUPR/SPEB

As requested, we have conducted a technical assessment in support of the five-year review for the Madison County Mines Superfund Site, located in Madison County, Missouri. Our evaluation is limited to providing input on human health and ecological risk issues. More specifically, we focused on answering Questions B and C from the U.S. Environmental Protection Agency's "Comprehensive Five-Year Review Guidance," dated June 2001. If you need additional assistance or have any questions regarding our comments, which are provided below, please contact Kelly Schumacher at x7438 or Catherine Wooster-Brown at x7425.

Background

The Madison County Mines Superfund Site is located in the Old Lead Belt in southeastern Missouri. It is divided into six Operable Units. An Interim Record of Decision was signed for the residential portion of Operable Unit 3 in July 2008, including single- and multi-family dwellings, apartment complexes, vacant lots in residential areas, schools, daycares, playgrounds, parks, and green ways. Only this portion of OU-3 is addressed in the five-year review report. Furthermore, the interim ROD only addresses those properties where lead (and other heavy metals when co-located with lead) results in unacceptable health risks. The final ROD will address residences where unacceptable health risks are solely due to metals other than lead. The Interim ROD established a soil lead cleanup goal of 400 ppm to ensure no greater than a 5% probability of exceeding a blood lead level of 10 µg/dl in a child or group of similarly exposed children less than 84 months of age. The remedy consisted of excavation and removal of soil; backfill with clean fill, topsoil, and vegetation; disposal of the soil; health education; and an institutional



controls pilot project. Except for garden areas, the remedy called for excavation down to 12 inches or until a lead concentration of 400 ppm was reached, whichever was less. If the soil at 12 inches contained greater than 1200 ppm of lead, excavation would continue to 24 inches if a lead concentration less than 1200 ppm could be reached; otherwise, a plastic barrier would be placed at 12 inches below ground surface.

Human Health Risk Assessor Comments

Technical Assessment

Question B – Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

Changes in Standards and TBCs

- *Have there been changes to risk-based cleanup levels or standards identified as Applicable or Relevant and Appropriate Requirements (ARARs) in the Record of Decision (ROD) that call into question the protectiveness of the remedy?* At this site, there are no risk-based cleanup levels that were identified as ARARs in the interim ROD.
- *Are there newly promulgated standards that call into question the protectiveness of the remedy?* There are no newly promulgated standards that call into question the protectiveness of the remedy.
- *Have TBCs been used in selecting cleanup level at the site changed in a way that could affect the protectiveness of the remedy?* At this site, the soil lead cleanup goal of 400 ppm was established to meet the U.S. Environmental Protection Agency's health protection goal of no more than a 5% probability of exceeding a blood lead level of 10 µg/dl in a child or group of similarly exposed children. Part of the basis for this goal was that the Centers for Disease Control and Prevention had determined that adverse health effects occur at or below a blood lead level of 10 µg/dl. In 2012, after the interim ROD for Madison County Mines was published, the CDC followed the advice of its Advisory Committee on Childhood Lead Poisoning Prevention and adopted a new reference value of 5 µg/dl, based on the 97.5th percentile blood lead level in children ages 1 to 5. The CDC plans to update this reference value every four years.

Currently, the EPA's health protection goal is still valid, and the remedy for the Madison County Mines site remains protective. However, the EPA is currently re-evaluating the goal, which may impact the protectiveness of the remedy in the future.

Changes in Exposure Pathways

- *Has land use or expected land use on or near the site changed (e.g., industrial to residential, commercial to residential)?* In general, land use for the properties addressed by the interim ROD has remained the same. That is, we assume that these properties will remain residential or could otherwise have young children present, such as in the case of parks and daycares. Because the remedy for OU-3 was based on residential assumptions, it remains protective if individual properties covered by the interim ROD switch to industrial or commercial use or become vacant.

- *Have any human health or ecological routes of exposure or receptors changed or been newly identified (e.g., dermal contact where none previously existed, new populations or species identified on site or near the site) that could affect the protectiveness of the remedy?* There are no newly identified routes of exposure.
- *Are there newly identified contaminants or contaminant sources?* The EPA's Lead-Contaminated Residential Sites Handbook (USEPA, 2003) states that resampling during the five-year review will assess whether recontamination of remediated properties is occurring, as well as "identify any pathways that may have been missed during remediation." Following USEPA (2003), we recommend re-sampling a percentage of the remediated properties to evaluate whether soil caps may have been disturbed and recontamination is occurring. As stated in the Handbook, the percentage to be re-sampled should be based on statistics. That is, enough re-sampling should occur in order to provide a certain level of statistical significance, so that we are confident that the re-sampling could detect recontamination. Particularly once the final ROD is published, we recommend conducting follow-up sampling of a portion of the remediated properties, consistent with USEPA (2003).
- *Are there unanticipated toxic byproducts of the remedy not previously addressed by the decision documents (e.g., byproducts not evaluated at the time of remedy selection)?* We are not aware of any unanticipated toxic byproducts.
- *Have physical site conditions (e.g., changes in anticipated direction or rate of groundwater flow) or the understanding of these conditions (e.g., changes in anticipated direction or rate of groundwater flow) changed in a way that could affect the protectiveness of the remedy?* We have no information to show that site conditions or the understanding of these conditions has changed.

Changes in Toxicity and Other Contaminant Characteristics

- *Have toxicity factors for contaminants of concern at the site changed in a way that could affect the protectiveness of the remedy?* Toxicity factors for some of the contaminants of concern at the site have changed. Table 1 lists those COCs for which the toxicity values used at the time of the 2007 risk assessment differ from the current value. Changes are highlighted in yellow. Because the risk assessment preceded RAGS Part F (USEPA, 2009), inhalation exposures were assessed on a body weight basis, instead of on a concentration basis. Thus, the units for all of the cancer and noncancer inhalation toxicity values have changed.

In general, these changes are not expected to impact the protectiveness of the remedy. Specifically, the interim ROD for OU-3 focuses on lead as the main COC. The remedy addressed other COCs when they are co-located with lead. However, the interim ROD states, "[a] determination will be made in the final ROD for OU-3 on addressing the remaining residential properties where heavy metals other than lead may present potential health risks." Thus, properties where unacceptable health risks are due solely to COCs other than lead will be addressed in a future ROD.

Table 1. Comparison of Available Toxicity Values

	2007 Baseline Risk Assessment Toxicity Values				May 2013 RSL Toxicity Values			
Chemical	CSF _o (mg/kg-day) ⁻¹	RfD _o (mg/kg-day)	CSF _i (mg/kg-day) ⁻¹	RfD _i (mg/kg-day)	CSF _o (mg/kg-day) ⁻¹	RfD _o (mg/kg-day)	IUR (μg/m ³) ⁻¹	RfC (mg/m ³)
Aluminum	---	1.0E+00	---	1.4E-03	---	1.0E+00	---	5.0E-03
Arsenic	1.5E+00	3.0E-04	1.5E+01	---	1.5E+00	3.0E-04	4.3E-03	1.5E-05
Barium	---	2.0E-01	---	1.4E-04	---	2.0E-01	---	5.0E-04
Beryllium	---	2.0E-03	8.4E+00	5.7E-06	---	2.0E-03	2.4E-03	2.0E-05
Cadmium-food	---	1.0E-03	6.3E+00	5.7E-05	---	1.0E-03	1.8E-03	1.0E-05
Cadmium-water	---	5.0E-04	6.3E+00	5.7E-05	---	5.0E-04	1.8E-03	1.0E-05
Chromium (VI)	---	3.0E-03	4.2E+01	2.9E-05	5.0E-01	3.0E-03	8.4E-02	1.0E-04
Cobalt	---	2.0E-02	9.8E+00	5.7E-06	---	3.0E-04	9.0E-03	6.0E-06
Manganese-nonfood	---	4.7E-02	---	1.4E-05	---	2.4E-02	---	5.0E-05
Thallium	---	7.0E-05	---	---	---	---	---	---
Vanadium	---	1.0E-03	---	---	---	5.0E-03	---	1.0E-04

- Have other contaminant characteristics changed in a way that could affect protectiveness of the remedy? We are not aware of any other changes to contaminant characteristics that could impact the protectiveness of the remedy.

Changes in Risk Assessment Methods

- Have standardized risk assessment methodologies changed in a way that could affect the protectiveness of the remedy? Several of the IEUBK model and adult lead methodology default input parameters have changed. These changes include the default dietary lead intake values and baseline maternal blood lead concentration for the IEUBK model, as well as the baseline blood lead concentration and geometric standard deviation for the ALM. However, these changes are unlikely to affect the protectiveness of the remedy. Concurrently with review of the EPA's health protection goal for lead, the Agency is also re-examining several default input values for the IEUBK model, which could impact the protectiveness of the remedy in the future.

As mentioned previously, current methodology used to assess exposure and risks via the inhalation pathway (USEPA, 2009) differ from the methods used in the 2007 Madison County Mines risk assessment. However, because the inhalation pathway is a minor contributor to risk compared to ingestion at this site, these changes are unlikely to affect the protectiveness of the remedy.

Question C – Has any other information come to light that could call into question the protectiveness of the remedy?

- *Are there impacts from natural disasters (e.g., a 100-year flood)?* We recommend that the five-year review indicate whether or not any natural disasters have occurred during the previous five-years, particularly flooding and tornados, which could disturb contamination at the site.
- *Has any other information come to light which could affect the protectiveness of the remedy?* At this time, we are not aware of any other information which could affect the protectiveness of the remedy. The interim ROD for OU-3 includes a pilot institutional controls project. If these ICs become part of the final remedy for the site, we note that USEPA (2003) calls for their documentation, tracking, and evaluation in future five-year reviews.

Ecological Risk Assessor Comments

This is the first five-year review for the Madison County Mines Site and this review is only for Operable Unit 3. OU-3 addresses contamination of soil and mine waste used for construction at residences, child high-use, and public areas. An Interim Record of Decision (USEPA, 2008), which was written specifically for Operable Unit 3 states that:

This Interim Record of Decision only addresses human health risk at residential properties within Madison County. Consequently, ...while an Ecological Risk Assessment was completed for the Site, a summary of it has not been included in this Interim Record of Decision. Other identified risks to human health and the environment will be addressed in future cleanup decisions.

Therefore, this five-year review does not address ecological risk assessment and a technical assessment addressing ecological risk issues was not performed. Future five-year reviews for the Madison County Mines site will address ecological risk assessment. At this time, protectiveness for the remainder of the Madison County Mines Superfund Site, OUs 1, 4, 5, 6 and 7, is deferred pending the start of remedial action for those with Records of Decision and those whose decision documents have not been completed.

References

- U.S. EPA. 2001. Comprehensive Five-Year Review Guidance. Office of Emergency and Remedial Response, Washington, D.C. EPA-540-R-97-036.
- U.S. EPA. 2003. Superfund Lead-Contaminated Residential Sites Handbook. Office of Emergency and Remedial Response, Washington, D.C. OSWER 9285.7-50.
- U.S.EPA. 2008. Interim Record of Decision for Residential Property Surface Soil (part of operable unit 3) at Madison County Mines Superfund Site in Madison County, Missouri.
- U.S. EPA. 2009. Risk Assessment Guidance for Superfund: Volume I – Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment). Office of Superfund Remediation and Technology Innovation, Washington, D.C. OSWER Publication 9285.7-82.
- U.S. EPA. 2012. Assessing Protectiveness at Sites for Vapor Intrusion, Supplement to the “Comprehensive Five-Year Review Guidance.” OSWER Directive 9200.2-84.

Attachment C

BLOOD LEAD DATA

MADISON COUNTY, MISSOURI

Data Provided by Missouri Department of Health & Senior Services and Madison County Health Department

YEAR COUNTY	Census Population of Children (<72 Months)	Total Number of Children Tested	Percent of Children (<72 months) Tested	Number of Children with EBLs	Percent Total Tested w/EBLs
*2012 MADISON	956	240	25%	4	2%
*2011 MADISON	835	261	31%	2	1%
*2010 MADISON	835	283	34%	4	1%
*2009 MADISON	835	112	13%	0	0%
*2008 MADISON	835	126	15%	2	2%
* 2007 MADISON	835	132	16%	1	1%
*2006 MADISON	835	303	36%	6	2%
*2005 MADISON	835	361	43%	8	2%
*2004 MADISON	835	470	56%	20	4%
*2003 MADISON	835	428	51%	26	6%
*2002 MADISON	835	363	43%	38	10%
*2001 MADISON	866	308	36%	41	13%
*2000 MADISON	866	341	38%	34	10%
*1999 MADISON	900	378	42%	34	9%
1998 MADISON	900	135	15%	16	12%
1997 MADISON	900	94	10%	5	5%

u/dl – micrograms per deciliter

EBL= Elevated Blood Level (equal to or greater than 10 u/dl)

<= less than

Target Population = 6 months to 72 months of age from Estimated Population for 1997-1999 and 2000-2010

Calendar Year Blood Lead Testing Data System covering the fiscal period of January through December for children less than six years of age.

*Represents years Madison County Health Department received Health Education funding through EPA